

REMARKS

Reconsideration and withdrawal of the rejections of this application and consideration and entry of this paper are respectfully requested in view of the herein remarks, which place the application in condition for allowance.

I. STATUS OF CLAIMS

Claims 1-14 are pending in this application. Claims 2, 5, 6, 8, 10, 12, and 14 have been amended herein, no new matter has been added by this amendment. Claims 15-19 were previously withdrawn from consideration in response to a restriction requirement. As it is believed that the instant claims, as amended are in condition for allowance, the cancellation of these claims is intended merely to further prosecution and issuance of a notice of allowance. The applicants thank the Examiner for indication of allowable subject matter in this Office Action (i.e. claims 7-10, 13 and 14).

It is submitted that the claims, herewith and as originally presented, are patentably distinct over the prior art cited in the Office Action, and that these claims were in full compliance with the requirements of 35 U.S.C. § 112. The amendments of the claims, as presented herein, are not made for purposes of patentability within the meaning of 35 U.S.C. §§ 101, 102, 103 or 112. Rather, these amendments and additions are made simply for clarification and to round out the scope of protection to which Applicants are entitled.

II. THE 35 U.S.C. 102/103 REJECTIONS

Claims 1, 2, 5, 11 and 12 were rejected under 35 U.S.C. 102(e) as being anticipated by Chan (U.S. 6,518,173). In response, the rejection is respectfully traversed for at least the following reasons. The rejection contends with respect to claims 1 and 2 of the instant application that that:

Chan (esp. Fig. 6) discloses a semiconductor device, comprising: at least two wiring layers (11, 12); a via contact (15) formed between the at least two layers and made of a metal wiring material which is the same as that of the, at least two wiring layers (copper), wherein the metal wiring material of the via, contact contains an additive (Cr) which is not contained in the metal wiring materials of the at least two wiring layers.

As the Examiner alleges, Chan discloses a semiconductor device comprising a via contact (15) formed between the at least two layers and made of a metal wiring material which is the same as that of the at least two wiring layers (Copper). However, contrary to the Examiner's

assertions, Chan does not disclose that the metal wiring material of the via contact contains an additive (Cr) which is not contained in the metal wiring materials of the at least two wiring layers. At best, Chan discloses a lining layer 17 which is composed of Cr, Ta, or a Ta-based material for lining the internal surfaces of the via holes 14. The lining layer 17 is not an additive as that term is defined by the instant application but an electrically conductive adhesion/barrier layer for the Cu-based via plug 15. (See Chan, col. 5, lines 54, stating "[t]hin layer 17 shown as lining the internal surfaces of the through-hole 14 formed in second and third dielectric layers 12, 13 acts as an electrically conductive adhesion/barrier layer for the Cu.-based via plug 15, and as before, may be comprised of Cr, Ta, or a Ta-based material."). Accordingly, it is respectfully submitted that the thin layer 17 is an independent layer from the Cu-based via plug 15, and does not correspond to the additive recited in claim 1, which is contained in the via contact.

In the "Response to Arguments" section in the Official Action, the Examiner contends that:

Regarding 1, 2,-5, A1 and. 12, applicant argues that the lining layer disclosed by Chan is not an additive as claimed in the instant application. On the contrary, interpreted broadly, the lining layers disclosed by Chan contribute to the overall interconnect structure of the device and are thus considered "additive" as claimed. For, the lining layers are not such that they prohibit conductivity of the device. Such layers are there simply to prohibit unwanted diffusion of copper from layer to layer. Such layers are - essential to the functionality of the device. Further, Chan describes such layers not only as lining layers, but as "adhesion layers," meaning that said layers are actually a part of the copper layers, and can be interpreted as "additive" layers, as claimed.

The argument offered by the Examiner fails for at least the following reasons. First, it requires the Examiner to unnecessarily and improperly insert the word "layer" into the claim to modify "additive." No support for this improper reading in of a claim limitation can be found. An additive is defined by the specification, and contrary to the Examiner's interpretation, cannot be read so broadly as to be an entirely separate "layer."

Next, the Examiner's attention is directed to layers 11A and 18A in FIG. 6 of Chan. The layer 11A is an adhesion/barrier layer made of Cr, Ta, or Ta'-based material, and provided for the copper-based metal feature 11 (i.e., the layer Ni). See column 5, lines 26-30, in which it is stated that:

the first copper-based metal feature 11 (M1) is formed in overlying electrical contact with electrical contact 10, and typically comprises a thin, lower adhesion/barrier layer 11A made of the aforementioned Cr, Ta, or Ta-based material, and a substantially thicker primary conductive layer 11B, of Cu or a Cu--based alloy.

The layer 18A is a thin, upper adhesion/barrier layer, and similarly provided for the copper-based metal feature 18 (i.e., the layer. M:2). See column 5, lines 55-58. If the Examiner's interpretation of "additive" layers is proper, which applicants respectfully dispute, then the layers 11A and 18A should be likewise interpreted as "additives" of the metal layers 11B and 18B that correspond to the at least two wiring layers recited in claim 1. But this interpretation results that the Cu based via plug 15 and metal layers 11B and 18E contain the same additive. That is, the Cu-based via plug 15 contains Cr, Ta, or Ta-based material, and the metal layers 11B and 18B contain Cr, Ta, or Ta-based material of the metal layers 11A and 18A. In other words, according to the Examiner's interpretation, Chan teaches that the Cu-based via plug 15 contains an additive which is contained in the metal layers 11A and 18A." It is therefore submitted that Chan does not teach a metal wiring material of the via contact contains an additive which is not contained in the metal wiring materials of the at least two wiring layers" recited in claim 1 of the present application. Accordingly, claim 1 patentably distinguishes over the relied upon portions of the cited reference and is allowable.

Regarding claim 5, the Examiner contends that:

Chan (esp. Fig. 6) discloses a semiconductor device, comprising: at least two wiring layers (11, 12); a via contact formed between the at least two layers and made of a metal wiring material (Cu) which is the same as that of the at least two wiring layers, wherein metal wiring materials of the at least two wiring layers contain at least one additive (Ta), and a metal wiring material of the via contact contains at least two additives (Ta based compound) which include an additive (Ta) which is the same as that contained in the metal wiring materials of the at least two wiring layers."

Claim 5 has been amended to recite "a metal wiring material of the via contact contains at least two additives which include an additive which is the same as that contained in the metal wiring materials of the at least two wiring layers and an additive which is not contained in the metal wiring materials of the at least two wiring layers." Accordingly for at least the reasons described above with respect to claim 1, it is submitted that claim 5 patentably distinguishes over the relied upon portions of the cited reference and is allowable.

Regarding claims 11 and 12, the Examiner contends that:

Chan (esp. Fig. 6) discloses a semiconductor device, comprising: a first metal wiring layer (11) made of a first wiring material (Cu), formed in a first wiring groove formed in a first insulating film (12) on a semiconductor substrate (8); a second insulating film (13) on the first insulating film having the first wiring layer embedded therein; a via contact (15) embedded in a via hole formed in the second insulating film the via contact being made of the same wiring material as the first wiring material, which contain an additive (Cr.) which is not contained in the first wiring material of the first wiring layer; a third insulating film (19) on the second insulating film having the via contact formed therein; and a second metal wiring layer (22) embedded in a second wiring groove formed in the third insulating film, the second metal wiring layer being made of the same metal wiring Material as the metal wiring material of the first metal wiring layer.

This rejection is respectfully traversed for substantially the same reasons discussed above with respect to claim 1. Specifically, claim 11 recites "a via contact embedded in a via hole formed in the second insulating film, the via contact being made of the same wiring material as the first wiring material, which contain an additive which is not contained in the first wiring material of the first wiring layer." Thus, claim 11 is not anticipated by Chan, and allowable.

Claim 6 was rejected under 35 U.S.C. 103(a) as being unpatentable over Chan. However, claim 6 depends from base claim 5, which as discussed above, is believed allowable. Accordingly claim 6, which depends from an allowable base claim is allowable therewith.

Similarly, dependent claims 2-4, and 12 are also believed to be allowable as they depend from allowable base claims.

Accordingly, withdrawal of the rejections under §§ 102 and 103 of claims 1, 2, 5, 6, 11, and 12 is respectfully requested.

In the event that the Examiner disagrees with any of the foregoing comments concerning the disclosures in the cited prior art, it is requested that the Examiner indicate where in the reference, there is the basis for a contrary view.

The Examiner has apparently made of record, but not applied, several documents. The Applicants appreciate the Examiner's implicit finding that these documents, whether considered alone or in combination with others, do not render the claims of the present application unpatentable.

CONCLUSION

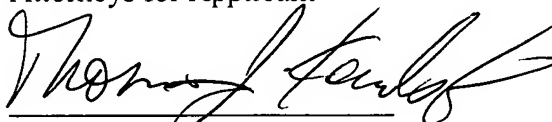
In view of the amendments, and remarks herein, the application is in condition for allowance. Reconsideration and withdrawal of the rejections of the application, and prompt issuance of a Notice of Allowance, are respectfully requested.

The Commissioner is authorized to charge any additional fee that may be required to Deposit Account No. 50-0320.

Respectfully submitted,

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